

SYSTEM AND METHOD FOR TRANSPORTING PERSONNEL WITHIN AN ACTIVE WORKSPACE

BACKGROUND

Technological advancements have made an ever-increasing amount of automation possible in inventory-handling and other types of material-handling systems. Namely, inventory-handling systems may be implemented using automated mobile drive units that are assigned to inventory-related tasks. The level of human involvement with such automated systems has been greatly reduced, leading to increased speed, throughput, and productivity. However, there may be circumstances where it is necessary for human operators to traverse, or otherwise go onto, an active workspace where the mobile drive units are carrying out their assigned inventory-related tasks. For example, mobile drive units or other equipment may fail or break down, or inventory items may fall out of their respective inventory holders onto the active workspace floor, requiring human operators to traverse the workspace to the location where the maintenance or cleanup is needed. However, traversing an active workspace of automated mobile drive units poses safety concerns for the human operators who traverse the active workspace.

Currently, automated inventory systems may be configured to shut down the entire active workspace, whereby all of the mobile drive units on the workspace floor are stopped and prevented from moving. While the mobile drive units are disabled, one or more human operators may traverse the workspace floor to a destination on or across the floor. Although this method is safe for the human operator, shutting down the entire inventory system is a great disruption to the inventory system that causes unnecessary downtime where no inventory-related tasks can be performed.

Other inventory systems may allow for a pathway to be reserved from the edge of an active workspace floor to a destination wherein no mobile drive units are allowed to move such that a human may traverse the active floor along the pathway without disrupting the remainder of the active workspace. Although this method is less disruptive than an entire system shutdown, a less intrusive means of allowing a human operator on an active floor is still needed.

BRIEF DESCRIPTION OF THE DRAWINGS

The detailed description is set forth with reference to the accompanying figures. In the figures, the left-most digit(s) of a reference number identifies the figure in which the reference number first appears. The use of the same reference numbers in different figures indicates similar or identical items or features.

FIG. 1 illustrates an example inventory system configured to transport users within a workspace via human transport devices.

FIG. 2 is a block diagram illustrating an example management module implemented as part of the inventory system of FIG. 1.

FIG. 3 illustrates an example inventory system according to another embodiment including a workspace having multiple zones that may be independently activated or deactivated.

FIG. 4A illustrates an example human transport device that may be implemented as part of the inventory systems of FIGS. 1 and 3.

FIG. 4B illustrates an example human transport device according to another embodiment that may be implemented as part of the inventory systems of FIGS. 1 and 3.

FIG. 5 illustrates in greater detail an example human transport device and the components therein that may be implemented as part of the inventory systems of FIGS. 1 and 3.

FIG. 6A illustrates an example system to transport a user within a workspace, the system including a plurality of sentinel drive units positioned at a perimeter of a protected area in proximity to a human transport device.

FIG. 6B illustrates the human transport device of FIG. 4B implemented in an example system to transport a user within a workspace showing the extendable physical barrier surrounding the human transport device.

FIG. 7 is a flow diagram of an illustrative process for transporting a user within a workspace using a human transport device.

FIG. 8 is a flow diagram of an illustrative process for designating and managing one or more protected areas within the workspace.

DETAILED DESCRIPTION

Embodiments of the present disclosure are directed to, among other things, techniques and systems for transporting one or more users within an active workspace.

In some embodiments, a human transport device configured to transport a user within a workspace includes a platform to support the user, and an enclosure coupled to the platform to surround the user when the user is situated within the enclosure and on the platform. The human transport device may further include a drive subsystem to power the human transport device for movement, and a control unit to control the movement of the human transport device in coordination with active mobile drive units, (sometimes referred to herein as "drive units"), moving within the workspace. The drive subsystem may be integral to the human transport device, or may be an autonomous mobile drive unit configured to lift and transport a portable cabin with a user therein, the combination of the autonomous mobile drive unit and the portable cabin making up the human transport device.

In some embodiments, a system to transport a user within a workspace includes a human transport device to transport the user to a destination location within the workspace, and a management module to direct movement of the human transport device with the user therein to the destination location in coordinated movement with active mobile drive units moving within the workspace.

In some embodiments, a process to transport a user within a workspace includes identifying a destination location within the workspace, and moving the human transport device with a user therein to the destination location in coordinated movement with active mobile drive units moving within the workspace. The process may further include designating one or more areas within the workspace as protected areas, prohibiting unauthorized objects from entering the protected areas, and allowing the human transport device to be within the protected areas.

The human transport device of the embodiments disclosed herein allows human users (e.g., maintenance workers) to traverse an active workspace in a minimally intrusive manner while maintaining safety of the user while he/she is within the active workspace. By coordinating movement of the human transport device with the movement of active mobile drive units that are carrying out inventory-related tasks, the productivity on the floor is minimally disrupted. Furthermore, by designation of one or more protected areas within the work-